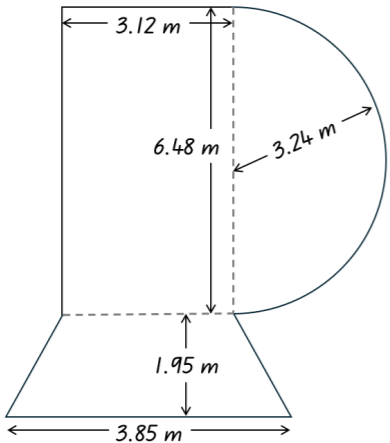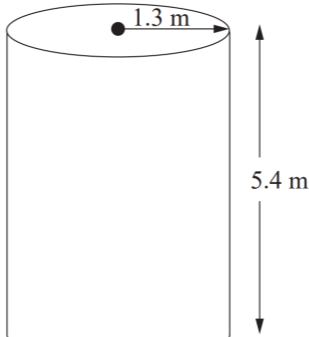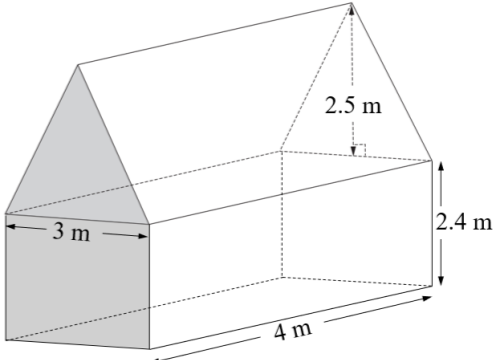Australian Curriculum v9.0: Using complexity and familiarity to create questions in Mathematics

The QCAA Mathematics standards elaborations use complexity and familiarity to describe the discernible differences between performance levels. Complexity and familiarity are described in the standard elaborations Notes section — Table 2. This resource provides examples of questions with different levels of complexity and familiarity for Year 10.

Aspect of the achievement standard	Related content description/s	Examples of evidence	Mathematical proficiencies
Students recognise the effect of approximations of real numbers in repeated calculations.	**Number** • recognise the effect of using approximations of real numbers in repeated calculations and compare the results when using exact representations AC9M10N01	• recognising the effect of approximations of real numbers in repeated calculations	Understanding

They solve measurement problems involving surface area and volume of composite objects.	**Measurement**
	• solve problems involving the surface area and volume of composite objects using appropriate units AC9M10M01
		• solving measurement problems involving
		  – surface area of composite objects
		  – volume of composite objects
			Fluency

They identify the impact of measurement errors on the accuracy of results.	**Measurement** • identify the impact of measurement errors on the accuracy of results in practical contexts AC9M10M04	• identifying the impact of measurement errors on the accuracy of results	Understanding

Complexity annotations	Complex unfamiliar questions (A or equivalent)	Familiarity annotations	Complexity annotations	Complex familiar questions (B or equivalent)	Familiarity annotations	Complexity annotations	Simple familiar questions (C or equivalent)	Familiarity annotations

Students make connections between calculating the volume of a composite object, considering the effect of approximations on real numbers in repeated calculations, and identifying the impact of measurement errors on the accuracy of results.
 	
Interpretation is required to develop a response.
	Technology active
	Keilee is laying concrete for her driveway. She has labelled a drawing of the driveway with her measurements below. The concrete for the driveway will be 10 cm deep. One bag of concrete will make 0.01 m³ of concrete.
	
	Diagram not to scale
	
	Keilee rounds all the measurements on the drawing to the nearest metre for her calculations. She calculates the number of bags of concrete she will need using her rounded values.
	Will Keilee have enough concrete for the driveway?
	Give clear mathematical reasoning for your solution.
		All the information to solve the problem is not immediately identifiable.
		
		The required procedure is not clear from the way the problem is posed.
		
		The context is unfamiliar to students as it was not the main focus in the teaching and learning program.
			Students make connections between repeated calculations with approximated numbers and the volume of a cylinder.
			
			Some interpretation is required to develop a response.
				Technology active
				A cylindrical rainwater tank is installed at a property, as shown.
				1m³ = 1000 L
				
				Diagram not to scale
				
				Kalyn calculates the capacity of the tank rounding all the measurements to the nearest metre and using $\pi = 3.14$.
				Reuben calculates the capacity of the tank by using measurements given on the diagram above and the π button on his calculator.
				To the nearest litre, how much larger is Reuben's answer for the capacity than Kalyn's answer?
					All the information to solve the problem is identifiable.
					
					The required procedure is clear from the way the problem is posed.
					
					The context is familiar to students as it was a focus in the teaching and learning program.
					
					Formulas have been explicitly taught and given to students in the assessment.
						Students solve measurement problems involving surface area and volume of composite objects.
						
						The question is broken into scaffolded parts.
							Technology active
							The solid below is made from a triangular prism, and a rectangular prism.
							
							Diagram not to scale
							
							a. Calculate the area (in square metres) of the shaded:
							  i. rectangle
							  ii. triangle
							  iii. complete face.
							
							b. Calculate the volume of the solid in cubic metres.
								All the information to solve the problem is identifiable.
								
								The required procedure is clear from the way the problem is posed.
								
								The context is familiar to students as it was a focus in the teaching and learning program.
								
								Formulas have been explicitly taught and given to students in the assessment.